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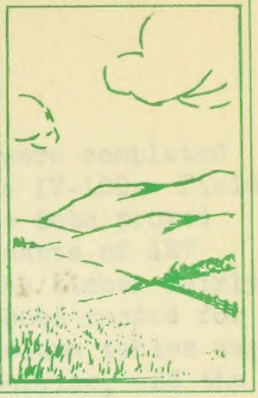

Research Note No. 32 May 10, 1943

TAPER AND VOLUME TABLES FOR PONDEROSA PINE ON SITE IV-100 IN CALIFORNIA

By

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and

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Satisfactory taper and volume tables for ponderosa pine on Site IV-100[1/] in California have long been needed. Extensive areas of valuable old-growth timber occur in this site class in the "Eastside" pine type, especially on the Modoc Plateau in the northeastern part of the State. Expansion of lumbering in these forests has increased the demand for tables to be used in cruising, appraisals, and working plans.

1/ Site IV-100 is the designation used for sites on which the dominant trees average 100 feet in height at 300 years. The site scale is described in Research Note No. 28, Calif. Forest & Range Expt. Sta., "A Site Classification for the Mixed-Conifer Selection Forests of the Sierra Nevada," by Duncan Dunning, 1943.

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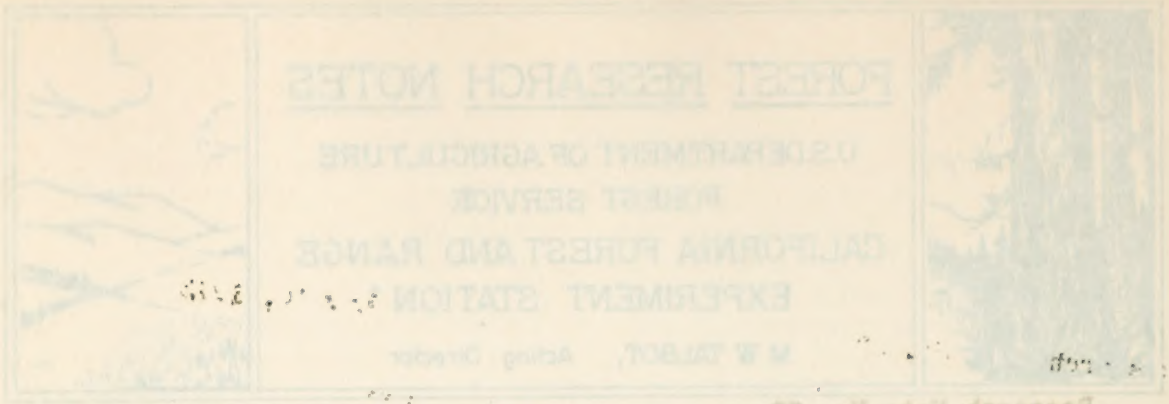


When volume tables for the first three site classes were completed in 1922, no tree measurements were available for Site IV-100. Field measurements for this site were made in 1924, but the data proved to be unsuitable. A table made in 1925 from measurements of 127 trees in the Modoc National Forest apparently fits the timber fairly well, but was intended as a local table and has not been tested for wider application. In 1927 a range-wide series of volume tables was constructed in the Washington office of the Forest Service, and the Site IV table[2/] of this series has been used in timber surveys in Region 5. The site scale to which this table is related differs from that of Region 5. The trees on which it is based included none from California; all represented the Rocky Mountain form of ponderosa pine. The check of tabular values against scaled volumes, discussed later in this note, indicates that this table is not well adapted to the Modoc timber. Careful tests of its suitability for other localities in California have not been made.

Taper tables yielding values corresponding to those in the volume table have not been available heretofore. Log grading and other refinements in appraisals have emphasized the importance of taper tables and the desirability of having corresponding volume tables derived from the taper measurements.

In response to these requirements the 127 Modoc trees of 1925 have been combined with 121 trees from the same locality measured in 1925 and 1930 to produce the volume and taper tables presented here.

The taper tables were constructed and harmonized graphically. The volume table was prepared directly from the taper tables by summarizing the log volumes for trees of various diameters and heights.

The taper tables give the diameter and volume of the top log as scaled at the uppermost 16-foot interval falling nearest to 8 inches inside bark. This was done for convenience of interpolation in preference to the usual procedure of scaling the top logs uniformly to a diameter of 8 inches but with variable length. It should be emphasized that correct use of these tables requires classification of the trees in the usual manner, that is, by height in 16-foot logs to an 8-inch top.

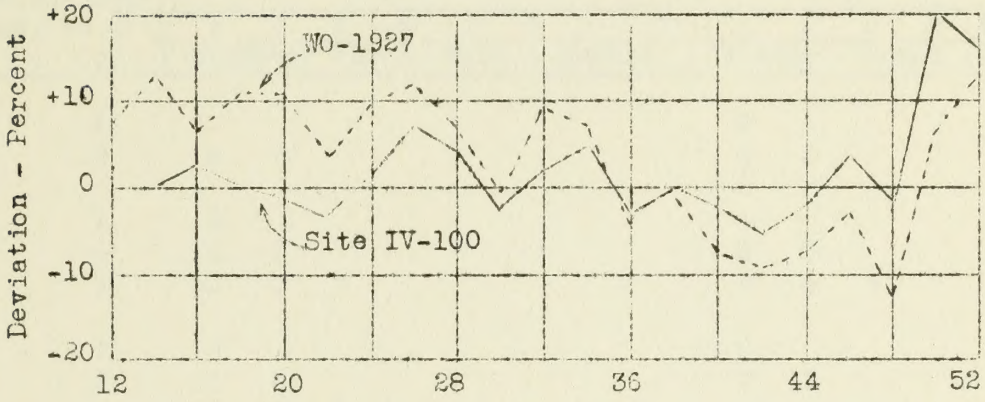
2/ Evans, O. M. 1938. Multiple volume tables. Form 71, R-5, sheets 1 to 44. U. S. Forest Service, San Francisco.

It is hoped that these tables may prove satisfactory standards for the territory. They should not be accepted as such, however, until dependable checks have been made under conditions of field use. Unfortunately such tests often are neglected or, because of defective procedure, are inconclusive. By the time shortcomings are finally exposed, many related tables such as cubic foot, board foot by International Rule, tables based on total height and similar variations have got into use and must be abandoned with the originals. As a guide to field testing, essential information on methods of construction is printed on the tables.

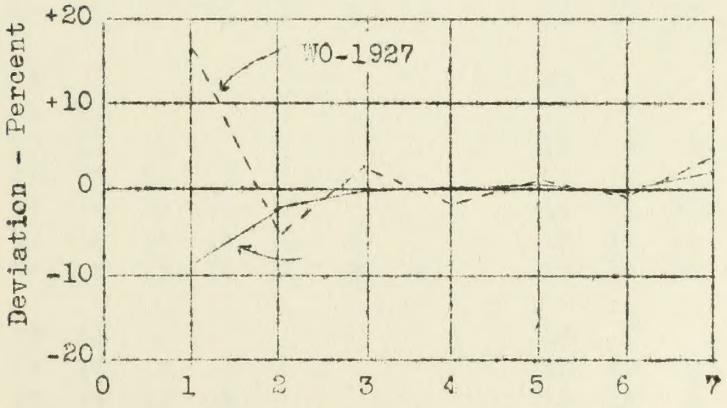
In 1927 range-wide Site IV table gave a total volume for the 248 Modoc trees only 840 bd. ft. greater than the scale but, as indicated by the accompanying graph, this close agreement resulted from compensating departures: the older table gave values consistently too high for the smaller trees and too low for the larger ones.

Comparison of the new Site IV-100 tabular volume with the total scaled volume of the 248 basic trees shows a difference of no consequence -- the table giving only 890 bd. ft., or 0.26 percent more than the direct scale of 338,870 bd. ft. The graph shows that the tabular deviations from scale for the several diameter and log classes also are consistently small and that the departures show no undesirable trend with either diameter or height. It is hoped that future tests will confirm the indicated superior fit of the new table.

Comparison of new Site IV-100 and Washington Office-1927 volume tables: Diameter and height class deviations from the scale of 248 trees in percent.



D.b.h., inches.
5 7 9 7 9 13 21 19 24 27 24 22 16 12 10 9 3 4 5 1 1
Number of trees



Height, 16-foot logs
5 10 20 53 85 61 13
Number of trees

TAPER AND VOLUME TABLES
PONDEROSA PINE
(Pinus ponderosa)
Site IV-100

U. S. Forest Service Region 5
Prepared by
California Forest and Range Experiment Station
1943

Keniston
Clements

Scribner Dec.
Logs 16.3 ft.
Top d.i.b. 8 i
Stump 1.5 ft.

D.b.h. inches	Height 16' logs to 8" top	Log number								Log number								T vo bd. t
		1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	
		Diameter inside bark - inches								Volume - board feet - tens								
12	1	8								3								
	2	9	7							4	3							
14	1	9								4								
	2	10	8							6	3							
	3	10	9	7						6	4	3						
16	1	10								6								
	2	11	8							7	3							1
	3	12	10	7						8	6	3						1
	4	12	11	9	6					8	7	4	2					2
	5	12	11	10	9	6				8	7	6	4	2				2
18	1	11								7								
	2	12	9							8	4							1
	3	13	11	8						10	7	3						2
	4	14	12	10	7					11	8	6	3					2
	5	14	13	12	10	6				11	10	8	6	2				3
	6	15	14	13	11	9	6			14	11	10	7	4	2			4
20	1	13								10								1
	2	14	10							11	6							1
	3	15	12	9						14	8	4						2
	4	15	13	11	7					14	10	7	3					3
	5	15	14	13	10	6				14	11	10	6	2				4
	6	17	15	14	13	10	6			18	14	11	10	6	2			6
	7	17	16	15	14	13	9	4		18	16	14	11	10	4	1		7
22	2	15	11							14	7							2
	3	16	13	9						16	10	4						3
	4	17	15	12	8					18	14	8	3					4
	5	17	16	14	11	7				18	16	11	7	3				5
	6	18	17	16	14	11	6			21	18	16	11	7	2			7
	7	19	18	17	15	14	10	4		24	21	18	14	11	6	1		9

D.b.h. inches	Height: 16' logs: to 8" top	Log number: Diameter inside bark - inches 1	2	3	4	5	6	7	8	Log number: Volume - board feet - tens 1	2	3	4	5	6	7	8	Tree volume bd. ft tens
24	2	16	12							16	8							24
	3	18	15	10						21	14	6						41
	4	19	16	13	8					24	16	10	3					53
	5	19	17	15	12	7				24	18	14	8	3				67
	6	20	18	17	15	11	6			28	21	18	14	7	2			90
	7	20	19	18	17	15	11	5		28	24	21	18	14	7	1		113
26	2	17	13							18	10							28
	3	19	16	10						24	16	6						46
	4	20	18	14	9					28	21	11	4					64
	5	21	19	16	13	8				30	24	16	10	3				83
	6	22	20	18	16	12	7			33	28	21	16	8	3			109
	7	22	21	20	18	16	12	5		33	30	28	21	16	8	1		137
28	2	18	13							21	10							31
	3	20	17	11						28	18	7						53
	4	22	19	16	9					33	24	16	4					77
	5	23	21	18	14	8				38	30	21	11	3				103
	6	23	21	19	17	13	7			38	30	24	18	10	3			123
	7	24	23	21	19	17	12	5		40	38	30	24	18	8	1		159
30	3	22	18	12						33	21	8						62
	4	24	21	17	10					40	30	18	6					94
	5	24	22	19	15	9				40	33	24	14	4				115
	6	25	23	21	18	14	7			46	38	30	21	11	3			149
	7	26	24	23	21	18	13	6		50	40	38	30	21	10	2		191
32	3	24	19	12						40	24	8						72
	4	25	23	18	10					46	38	21	6					111
	5	26	24	20	16	9				50	40	28	16	4				138
	6	26	25	22	19	14	7			50	46	33	24	11	3			167
	7	28	26	24	22	19	14	6		58	50	40	33	24	11	2		218
34	3	25	21	13						46	30	10						86
	4	27	24	19	11					55	40	24	7					126
	5	28	25	22	17	9				58	46	33	18	4				159
	6	28	26	23	20	15	8			58	50	38	28	14	3			191
	7	29	28	26	23	20	14	6		61	58	50	38	28	11	2		248
36	3	27	22	14						55	33	11						99
	4	29	26	21	11					61	50	30	7					148
	5	30	27	23	17	10				66	55	38	18	6				183
	6	30	28	25	22	16	8			66	58	46	33	16	3			222
	7	31	29	27	24	20	15	7		71	61	55	40	28	14	3		272

D.b.h. inches	Height: 16' logs: to 8" top	Log number: Diameter inside bark - inches: 1	2	3	4	5	6	7	8	Log number: Volume - board feet - tens: 1	2	3	4	5	6	7	8	Tree volume bd. ft. tens
38	3	28	23	14						58	38	11						107
	4	31	28	22	12					71	58	33	8					170
	5	32	28	24	18	10				74	58	40	21	6				199
	6	32	30	26	23	16	8			74	66	50	38	16	3			247
	7	33	31	29	26	21	16	7		78	71	61	50	30	16	3		309
40	4	33	30	23	12					78	66	38	8					190
	5	34	30	26	19	11				80	66	50	24	7				227
	6	34	32	28	24	17	8			80	74	58	40	18	3			273
	7	35	33	30	27	22	16	7		88	78	66	55	33	16	3		339
42	4	35	31	25	13					88	71	46	10					215
	5	35	32	27	20	11				88	74	55	28	7				252
	6	36	34	30	25	18	9			92	80	66	46	21	4			309
	7	37	35	32	28	23	17	8		103	88	74	58	38	18	3		382
	8	37	35	33	31	27	22	16	7	103	88	78	71	55	33	16	3	447
44	4	37	33	26	13					103	78	50	10					241
	5	37	34	29	21	12				103	80	61	30	8				282
	6	38	35	31	26	19	9			107	88	71	50	24	4			344
	7	38	36	33	29	24	17	8		107	92	78	61	40	18	3		399
	8	39	37	35	32	28	23	16	7	112	103	88	74	58	38	16	3	492
46	4	39	35	27	14					112	88	55	11					266
	5	39	35	30	22	12				112	88	66	33	8				307
	6	40	37	33	28	20	9			120	103	78	58	28	4			391
	7	40	38	34	30	24	18	8		120	107	80	66	40	21	3		437
	8	40	39	36	32	28	23	16	8	120	112	92	74	58	38	16	3	513
48	4	41	37	29	14					127	103	61	11					302
	5	41	37	31	22	12				127	103	71	33	8				342
	6	42	39	35	29	21	10			134	112	88	61	30	6			431
	7	42	39	36	31	25	18	9		134	112	92	71	46	21	4		480
	8	42	40	37	33	29	23	16	8	134	120	103	78	61	38	16	3	553
50	5	43	39	33	23	13				140	112	78	38	10				378
	6	44	41	36	30	21	10			148	127	92	66	30	6			469
	7	44	41	37	32	26	18	9		148	127	103	74	50	21	4		527
	8	44	42	38	34	29	24	16	8	148	134	107	80	61	40	16	3	589
52	5	45	41	34	24	13				152	127	80	40	10				409
	6	45	42	38	32	22	10			152	134	107	74	33	6			506
	7	46	42	38	33	26	19	9		159	134	107	78	50	24	4		556
	8	46	43	39	35	30	24	16	8	159	140	112	88	66	40	16	3	624

D.b.h. inches	Height 16' logs to 8" top	Log number 1	2	3	4	5	6	7	8	Log number 1	2	3	4	5	6	7	8	Tree volume bd. ft tens
		Diameter inside bark - inches								Volume - board feet - tens								
54	5	47	43	36	25	14				166	140	92	46	11				455
	6	47	44	40	33	23	10			166	148	120	78	38	6			556
	7	47	44	40	34	27	19	10		166	148	120	80	55	24	6		599
	8	48	45	41	36	30	24	16	9	173	152	127	92	66	40	4		670
56	5	49	44	37	26	14				180	148	103	50	11				492
	6	49	46	41	34	24	11			180	159	127	80	40	7			593
	7	49	46	41	35	28	19	10		180	159	127	88	58	24	6		642
	8	50	47	42	36	30	24	16	9	187	166	134	92	66	40	16	4	705
58	6	51	47	43	36	25	11			195	166	140	92	46	7			646
	7	51	47	43	36	28	20	10		195	166	140	92	58	28	6		685
	8	52	48	43	37	31	24	16	9	202	173	140	103	71	40	16	4	749
60	6	53	49	44	37	27	11			210	180	148	103	50	7			698
	7	53	49	44	37	29	20	11		210	180	148	103	61	28	7		737
	8	54	50	44	38	31	24	16	9	218	187	148	107	71	40	16	4	

Basis 248 trees, Modoc National Forest, 1923, 1924, 1925, and 1930.

VOLUME TABLE
PONDEROSA PINE
(Pinus ponderosa)
Site IV-100
U. S. Forest Service Region 5
Prepared by
California Forest and Range Experiment Station
1943

Keniston Clements — Scribner, Decimal C.

D.b.h. inches	Number of 16-foot logs to 8.0" top d.i.b.								No. of trees
	1	2	3	4	5	6	7	8	
Volume, bd.ft. - tens									
12	3	7	..	..	..	..	..	..	5
14	4	9	13	..	..	..	..	..	7
16	6	10	17	21	27	..	..	..	9
18	7	12	20	28	37	48	..	..	7
20	10	17	26	34	43	61	74	..	9
22	..	21	30	43	55	75	95	..	13
24	..	24	41	53	67	90	113	..	21
26	..	28	46	64	83	109	137	..	19
28	..	31	53	77	103	123	159	..	24
30	..	..	62	94	115	149	191	..	27
32	..	..	72	111	138	167	218	..	24
34	..	..	86	126	159	191	248	..	22
36	..	..	99	148	183	222	272	..	16
38	..	..	107	170	199	247	309	..	12
40	..	..	..	190	227	273	339	..	10
42	..	..	..	215	252	309	382	447	9
44	..	..	..	241	282	344	399	492	3
46	..	..	..	266	307	391	437	513	4
48	..	..	..	302	342	431	480	553	5
50	..	..	..	..	378	469	527	589	1
52	..	..	..	..	409	506	556	624	1
54	..	..	..	..	455	556	599	670	..
56	..	..	..	..	492	593	642	705	..
58	..	..	..	..	..	646	685	749	..
60	..	..	..	..	..	698	737	791	..
No. of trees	6	10	20	53	85	61	13	..	248

Prepared from taper table for Site IV-100.
Basis: 248 trees measured on the Modoc National Forest in 1923, 1924, 1925, and 1930.
Stump height 1.5 feet.
Scaled in 16.3 ft. logs to full log nearest 8.0 inch top d.i.b.
Aggregate deviation: table 0.26% high.
Average percentage deviation: 12.4%